	A	B	C	D	E	F	G
1	Title	Background	Justification for Space Flight & Experiment Description	Flight Requirements			
2				Orbit	Altitude	Inclination	Correlative Environment Measurements
3	Solar array arcing	Several spacecraft have been damaged recently by spacecraft charging that is caused either by solar substorms in MEO/GEO or by high voltage arrays in LEO. The possibility of damage from charging has also necessitated the addition of a plasma contactor on International Space Station (ISS). One of the major unknowns in testing for solar array arcing is how much of the array is involved in an arc.	In-space characterization of solar-array arc coupling is needed so that ground test protocols can be improved. In-space experimentation must be done, because ground test facilities cannot replicate the space environment. A characterization will include biasing the solar arrays to high voltages (300 V or more) while they are separated by up to 10 meters. Arc coupling currents will be measured on the array bias supplies. The array area discharged in an arc will yield the total connected capacitance discharged in an array arc.	LEO/MEO/GEO	LEO/MEO/GEO		Particle detectors
4	Validation of high voltage solar array technologies	Several spacecraft have been damaged recently by spacecraft charging that is caused either by solar substorms in MEO/GEO or by high voltage arrays in LEO. New solar array designs have been produced to prevent charging and arcing and these need space flight validation.	In-space validation is needed to confirm the ground test results about the charging and arc-mitigation features of these array types, because the ground test facilities cannot replicate the space environment. Requirements of in-space testing are high voltage power supplies (>500 V), transient pulse monitors, at least 3 samples of new technology solar arrays, and one sample of an old-technology solar array.	LEO/MEO/GEO			Langmuir probe, V-body, or charging monitor
5	Space radiation effects on solar cells	A method for solar cell radiation effects analysis is being developed that greatly reduces ground test data requirements while increasing the accuracy of the prediction. It has not been validated with space data for new technologies (such as thin film and multi-band gap technologies).	In-space data collection is needed, because the ground test facilities cannot replicate the space environment. The experiment will sweep the voltage and measure the current for several types of solar cells, so that IV curves can be measured as a function of time in space.	High Radiation Exposure	Possibly GTO		Incident Radiation
6	Changes in material properties important to spacecraft charging	Modeling of spacecraft charging with existing engineering tools often underestimates the correct magnitude of charging for actual satellites. It is suspected that materials in ground-based testing differ from those exposed to the real space environment. Material properties affecting spacecraft charging are known to change due to space-induced modification and contamination. In order to correctly predict charging, changes in spacecraft surface material properties exposed to space environments must be monitored.	In-space testing must be done, because synergistic effects of the space environment cannot be duplicated in the lab. A space experiment will include measurements of secondary and back scattered electron yields along with characterization of surface modifications and contamination for a set of commonly used and innovative spacecraft surface materials as a function of time in space.	GTO/MEO/GEO			Charging monitor
7	Dielectric charging data collection	Measurements in space taken using a number of surface potential monitors (SPMs) have shown that outer surfaces of spacecraft charge. However, the level of insulated surface charging inside the spacecraft, the amount of charging outside the spacecraft, and the role of solar activity in charging internal dielectric surfaces have not been correlated and are needed to improve the design models.	Simplified SPMs could be used to make the measurements. Metal Oxide Semiconductor (MOS) technology has been proposed to make these measurements in the past. Newer MEMS technology for electrostatic analyzers under commercial development could be adapted. Correlative environment data would provide information about the relationship between of the solar variability and the amount of charging.	LEO POLAR, GTO, MOLIYA, GEO			Electron flux or dose rate

	A	B	C	D	E	F	G
1				Flight Requirements			
2	**Title**	**Background**	**Justification for Space Flight & Experiment Description**	**Orbit**	**Altitude**	**Inclination**	**Correlative Environment Measurements**
8	Devices to control surface charging	Traditional spacecraft charging (caused by solar substorms) has damaged several satellites in GTO and GEO orbits. Concepts for new devices to control surface charging have been developed as a result of the failure investigations. These new devices to control charging may decrease or eliminate the need for xenon expellants and the associated complicated and massive control circuitry.	The control devices need to be space flight validated, because potential barriers and low neutral density plasma of GEO/MEO cannot be duplicated in the lab. The new devices require no fuel and the current is self-regulating. They consist of low-power, lightweight electron emitters that are driven by solar array voltage and overcome potential barriers by emitting electrons of 50 eV or more.	MEO/GEO			Particle detectors
9	Discharge pulses and their effects	Discharge pulses may occur and interfere with or burn out electronics. However, the frequencies and amplitudes of the pulses and methods for accommodation and/or mitigation of the effects are not well characterized. Ground testing does not reproduced the space environment, so space experiments are needed.	Perform a space experiment to measure the frequencies and amplitudes of pulses for a variety of technologies including insulation on cabling, connectors, and microcircuit packaging. Assess the effectiveness of mitigation techniques for pulses and correlate the effectivenesses with the strength of the pulses.	LEO POLAR, GTO, MOLIYA, GEO			Electron flux or dose rate